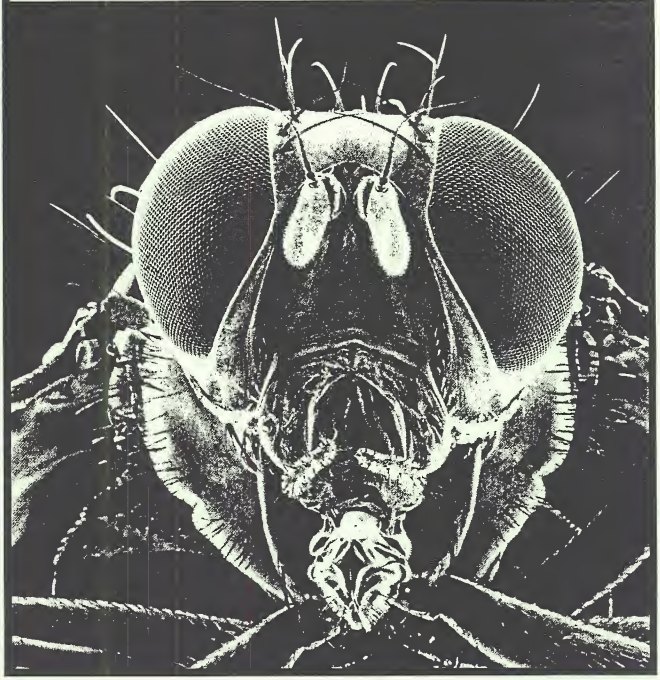
MSTA

Dedicated to Quality Science Education

Montana Science Teachers Association

Newsletter

Volume 8
Number 1



About the Cover: This photograph of a fruit fly, *Drosophila*, was taken with an electron microscope, an instrument that has contributed greatly to scientific study of the structures of life. Close study of the fruit fly has taught us much about the passing of inherited traits from one generation to the next, and has opened new windows on the mechanisms of our own inheritance. The photo came from flatbed scanning a 1st edition textbook cover entitled *Bioscope*,Mayfield Publishing Company, Palo Alto, California, 1979.

In This Issue...

WELCOME TO THE 1989 MONTANA SCIENCE CONFERENCE

MSTA
BEST
MSAAPT
MESTA
(Mt)ACS
(Mt)NABT
MAS
MEEC

AND OTHER AFFILIATED GROUPS

The Science Hospitality Room is next to the library in room 102. There will be a place to sit, take off your shoes, put your feet up and partake of free refreshments. Good company will be available .....maybe even a little intelligent conversation. There will be more displays than ever before and of course, the Planetarium from the Museum of the Rockies. Also present will be the science information table where membership rolls, membership cards, newsletters and other data for MSTA and other affiliates will be available.

COME AND JOIN US!!!!

B.E.S.T.

BETTER ELEMENTARY SCIENCE TEACHING PROJECT

On behalf of the MSTA, we welcome all the BESTERS to the '89 science conference. We hope you enjoy the conference and take home many usable activities, and ideas to your students and teaching colleagues. Please visit the MSTA Hospitality Room and commingle with the many teachers having interests similar to your own. You are most cordially invited to attend the Bob Makela Memorial Luncheon. This is your conference...enjoy it!

SCHEDULE OF B.E.S.T. ACTIVITIES:

Friday

6:00 p.m.: No host social hour at the Sheraton.
7:00 p.m.: Dinner at Sheraton.
8:00 p.m.: Welcome and short talk about new B.E.S.T. Grant Proposal.
9:00 p.m.: No host tour of Great Falls nite life.

Saturday

8:00 a.m: Breakfast at the Sheraton
9:00 a.m: Activities Writing Project meeting
10:00 a.m.: Breakout sessions
12:00 a.m.: Luncheon and Adjourn
1:00 p.m.: Special help.....sub-group writing meetings etc. (Optional....none of these meetings are scheduled.)

A SPECIAL TABLE HAS BEEN SET UP IN THE MSTA HOSPITALITY ROOM FOR THE CONVENIENCE OF THE BESTERS. A MESSAGE BOARD AND OTHER INFORMATION WILL BE AVAILABLE. PLEASE CHECK IN PERIODICALLY DURING THE CONFERENCE.

MONTANA SCIENCE TEACHERS ASSOCIATION

Fall Convention
Great Falls, Montana
October 19-20, 1989

"I know there's a concept here somewhere!"

BOB MAKELA MEMORIAL LUNCHEON

THURSDAY, OCTOBER 19, 12:00 NOON
GREAT FALLS SHERATON

Hans O. Anderson, NSTA President will be the Keynote Speaker.

Tickets for the luncheon will be available at the door for $6.50

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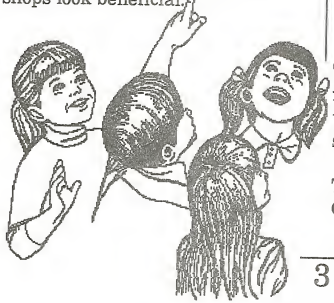
Space is limited. Get your tickets early from the MSTA Hospitality to assure a seat.

Dr. Anderson will also be speaking from 11:00 to noon on Friday in CMR room 602. His topic will be *Pride Inside*. See your convention program for details.

Science Workshops for Elementary and Middle School Teachers

At the MEA-MST convention in Great Falls in October 1989 there will be several workshops offerred that are particularly suited for elementary and middle school teaching levels. (There are certainly more than the two listed here) The following two workshops are being presented by M SAAPT and there are costs per participant because of the materials that will be taken home. Unfortunately, funding for these workshops is currently not available so individual participants will probably have to pay. The good news is that each of your school districts has access to Title II money that can be used for this purpose. The reason for this article is to remind or inform you of that option. Plan ahead and talk to your own district to fund your participation if these workshops look beneficial.

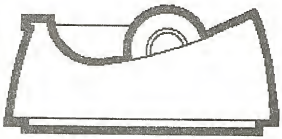


STRING AND STICKY TAPE: A Make and Take Workshop for Physical Science and Physics Teachers

Presenters: Glenn Govertsen and Darlene Ruble

This worKshop stresses demonstrations and labs with inexpensive equipment. It includes a well ordered workbook for resource and also materials to take.

Ticketed workshop-24 Maximum
Cost $25



SAW - SCIENCE ACTIVITY WEEKLY

Presenters: David and Joy-Lynn McDonald

This workshop will present 36 high interest, ready to use, hands on activities or demonstrations (one per school week!) for grades 1-6).

Ticketed workshop-24 Maximum
Cost $25

nabt News Release

Outstanding Biology Teacher Award

Direct from Craig R. Kuchel
State OBTA Director
Florence-Carlton High School
5540 Old Highway 93
Florence, MT 59833

The selection committee for Montana's Outstanding Biology Teacher Award Program has selected Ms. Patricia D.B. Abel, biology teacher at Belgrade High School, as the recipient of this year's Outstanding Biology Teacher Award.

The annual award program, conducted by the National Association of Biology Teachers, is intended to identify and reward excellence in biology teaching by selecting an Outstanding Biology Teacher in each of the 50 states. The program is sponsored by the Prentice Hall Publishing Company, which presents each award winner with a world Class pair of binoculars. In addition, winners also receive certificates and public recognition of their contribution to science education. All recipients will be invited to a special luncheon to honor awardees, held in conjunction with the National Association of Biology Teachers' National Convention In San Diego, in October, 1989.

All the nominees for this year's award were highly qualified and Ms.Abel's selection as the 1989 award recipient is indicative of her valuable contribution both to the education profession and to her students.

Three other outstanding teachers of biology were selected to receive honorable mention awards in this year's selection process. Linda de Kort of Flathead High School in Kalispell, Carroll Lorang of C.M. Russell High school in Great Falls, and Tom Pederson of Capital High School in Helena received honorable mention certificates.

Congratulations to all of these fine biology teachers...their peers, their students, and the parents of their students who have expressed great appreciation for their dedication.

NSTA / MSTA AWARDS FOR SCIENCE

Are you or a colleague doing something worthy of recognition? There are more opportunities for awards and recognitions that ever before. The NSTA depends on the members of the science teaching community to assure that the most exciting and deserving situations are nominated and/or described. **You and every science teacher are encouraged to accept this invitation as a personal one.** Apply for an NSTA award: AGA-STAR, Ohaus Program for Innovations in Science Teaching, CIBS-GEIGY Exemplary awards, Sheldon Exemplary award, Distingusihed Service to Science Education, the Robert H. Carleton Award, Distingusihed Teaching Award, and others. For information, write NSTA Awards Programs, 1742 Connecticut Ave. NW, Washington, D.C. 20009. The MSTA also has an awards program for both teachers and students, write Richard Micheletto, MSTA president, 706 Polaris Way, Missoula, MT 50803, for information on teacher awards and Dick Holmquist, Sentinel High School, 901 South Ave. West, Missoula Mt 59801, for student awards.

The deadline for submissions of entries is November 15, 1989.

Report by Research Associate at Mountain States Energy

Alan J Eliason recently completed a summer research appointment in Idaho Falls and wrote Bob Briggs, Science Specialist at OPI the following report:

Dear Bob:

I am pleased to report that the summer research associate appointment that I had at Mountain States Energy this summer was an informative, educational, and enjoyable experience. The first week or so I was assigned various references to read and gain some background about the MHD process in general, as well as material on the behavior and composition of the coal slag that forms on all the inner combustion surfaces. The slag that forms on the cathode, anode, and side walls of the MHD channel is known to effect the electrical performance of the channel during prolonged tests. When potassium ions, which is introduced as seed begins to electrolytically plate out on the cathode as potassium metal, it can short out a group of cathode bars and cause local electrical field conditions that lead to arcing. This condition is very errosive to the channel electrodes and is responsible for decreasing the MHD channel life significantly.

A poster session was held July 26th in Idaho Falls where all the summer interns and teacher associates presented a poster letter explaining the research with which they were involved. The following day we spent touring many of the atomic reactor sites and research facilities of the Idaho National Engineering Laboratories (INEL). This was a great two day science experience that I am very glad to have had the opportunity in which to participate. My poster letter was titled: *An Overview and Analysis of Slag Properties Related to MHD Channel Performance.* It dealt with information about the causes of cathode shorting and about the good and bad properties of coal slag. By manipulating the chemistry of the coal slag, it is believed that researchers can greatly reduce the erosion caused by the arc mode of current transfer in the channel.

Much of my research work this summer involved a spread sheet data analysis of the chemical information taken from some 15 to 20 prior MHD tests. I used the Lotus l-2-3 program and an IBM pc to build 240 graph files of the concentrations of four main slag elements! sampled at 10 locations along the system's flow path. These were plotted out and compared to the mean values of the element concentrations for all 15 plus tests. We were also required to incorporate what we had learned into a lesson plan format of our own choosing.

The personell I met and worked with at MSE were really great. I would highly recommend this eight week assistantship to any chemistry or physics teacher that wants to have a first hand look at the research environment. we were also able to earn three credit hours from ISU, and the stiepend was very nice too.

Sincerely

Alan J. Eliason

DOE-TRAC

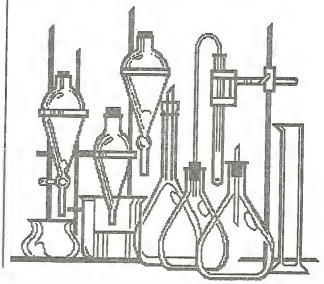
TEACHER RESEARCH ASSOCIATES

Through its National Laboratories, the Department of Energy supports the development and training of scientists and engineers to meet the nation's future human resource needs in energy science and technology. This mission is accomplished in part through summer programs for precollege teachers and students at the National Laboratories.

Teacher Research Associates (TRAC) appointments provide outstanding secondary-school teachers from across the nation with the opportunity to join ongoing summer research-participation programs for teachers at DOE Laboratories. The TRAC program encourages participants to share with their students and teaching colleagues the experience and knowledge gained through scientific research.

Each teacher is assigned to a research project at one of the participating laboratories. Assignments are based on the teacher's educational background and stated area of research interest. Teacher Research Associates receive eight-week appointments. The research assignment constitutes approximately 80% of the 40-hour week. The remaining time is spent attending seminars, lectures, and group meetings. Each teacher is asked to submit: (1) a final report describing his or her research assignment and (2) instructional material for transferring his or her newly acquired knowledge to the classroom. The DOE also encourages TRAC teachers to conduct, for fellow teachers in their school districts, academic-year workshops based on the summer research experience. School districts are asked to provide workshop opportunities.

Several Montana teachers have been awarded these fellowships and have all had great experiences. If you are interested in being nominated for one of these opportunities, write Bob Briggs, Office of Public Instruction, State Capitol, Helena Mt. 59620, call 444-4439, or leave a message on Goliath.



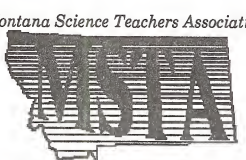
MSTA MEMBERSHIP

The next few years will be extremely important to the future of science education in America, but especially in Montana. Action is occuring on all fronts, accreditation standards, certification standards, curriculum standards, curriculum development, curriculum integration, higher education admission requirements, college preparatory requirements, standardized testing, evaluations, NSF grants, math and science Title II funds, special science programs for teachers and students, new technologies, new organizations, national curricula and much more.

It is absolutely essential that MSTA represent its membership and that the membership represent K-12 science educators. from across the state. Input from the higher education, administrative and science communities is also critical.

PLEASE JOIN THE MSTA. WE DESPERATELY NEED YOU!

Montana Science Teachers Association



Dedicated to Quality Education

Excellence Awards in Science Teaching

Patricia Able, a biology/physics teacher from Belgrade High School, Marilyn Alexander, a chemistry teacher from Capital High School in Helena, and Darleen Ruble, a physics/chemistry teacher from Lincoln County High School in Eureka, are state winners of the Presidential Awards for Excellence in Science Teaching. They will represent Montana in the National Competition.

This Teacher Incentive Program is co-sponsored by the U.S. Department of Education and the National Science Teachers Association and coordinated by OPI. It is designed to enhance the professional status of science teachers across the nation by annually honoring an outstanding science teacher from each state.

The awards identify outstanding high school science teachers as models for other teachers; they also encourage good teachers to remain in the classroom.

Why and how are words so important that they cannot be too often used

...Napoleon

ACCREDITATION STANDARDS FOR SCIENCE

The new Board of Education Accrediation Standards (listed below) include a statement of the philosophy of science education and a set of program goals. These standards are now required for all schools as of 7/1/89. Also included, but not required at this time, are a set of learner goals for primary, intermediate and high school students. The high school learner goals are further divided into core subject learner goals. You can find these in the new accreditaton standards manual found in your principals office, but I would be glad to send you a set for science. Write Bob Briggs, OPI, State Capitol, Helena, MT 59620.

Sub-Chapter 15
Science: Program

Science is a creative process used to investigate natural phenomena, resulting in the formation of theories verified by directed observations. These theories are challengeable and changeable. Data used to support or contradict them must be reproducible. Although science as a body of knowledge is ever changing, the processes of science are constant. In scientific procedure, a problem is identified, pertinent data is gathered, hypothesis is formulated, experiments are performed, the results are interpreted, and conclusions are drawn.

Science education strengthens students' basic investigative skills and fosters their understandings of and interest in the world. They acquire and apply critical thinking and problem solving skills and information critical to survival in a technological society.

RULE 10.55.1501 SCIENCE PROGRAM (In accordance with ARM 10.55.603 and ARM 10.55.1001) (1) A basic program in science gives students the opportunity to:

(a) Use scientific processes and communicate how they are used to develop scientific knowledge.

(b) Develop the use of science skills to enhance his/her ability to think logically, critically, and creatively.

(c) Recognize that scientific knowledge is continually subject to review, verification, and revision.

(d) Gather reliable information in all areas of the sciences, using chemicals, laboratory equipment and hands-on activities safely and appropriately.

(e) Show competence in measurement and mathematics.

(f) Gain and convey information through oral, written, and graphic communication.

(g) Recognize the character of independent and dependent variables.

(h) Understand the core concepts of current scientific knowledge and use them in problem solving and decision making.

(i) Identify problems of individual or social importance and select and apply appropriate scientific techniques to investigate these problems.

(j) Understand the interactions of science, technology, and society.

(k) Explore the use of science-related skills effectively in careers, leisure activities, and lifelong learning. (Eff. 7/1/89)

PROJECT WILD / PROJECT LEARNING TREE

IMPORTANT UPDATE

Many changes are now taking place with these important environmental science programs. The Montana Department of Fish, Wildlife, and Parks has hired a full-time Project Wild Coordinator, with an operating budget, to assist the facilitators with training opportunities across the state. We are now assured of having the resources to meet teacher needs for these activities. The new coordinator is Curt Cunningham, a teacher who has been serving as assistant Project Wild Coordinator for the state of Colorado. Curt will be on board with FWP by October 1. More information will be available in the next MSTA newsletter.

Some good things are also happening with Project Learning Tree. The state is now assured of funding for PLT books. Our state facilitators can now conduct workshops as needed. Kathy Anderson, from the Montana Wood Products Association, is working with the National PLT staff and OPI staff to revitalize the project in Montana. Kathy found some money for books and is looking for funds to conduct statewide workshops. A meeting of people interested in promoting statewide use of PLT is being held in Kalispell on the 29 of September. Bob Briggs, Mike Cavey, Spencer Sartorius, Bob Krepps, Kathy Anderson, a representative from the National PLT office and others will be in attendance. PLT is looking up!

Treasure Chests

Agriculture in Montana Schools will be delivering a Treasure Chest to every school with 20 or more students. Small schools may obtain the chest from your County Superintendent. A Number of groups have been building the chests, including FFA groups and Kiwanis groups. The box is filled with free hands-on teacher-aid materials that go along with curriculum guides. There are large, beautiful nature posters covering insects to mushrooms.

How to Root Plant Cuttings*

Introduction: The purpose of this module is to assist you in developing the skills needed to root a variety of types of plants, and to obtain 9 healthy rooted plants from each 10 cuttings.

Materials:

new single-edged razor blades
toothpicks builder's sand
peat moss vermiculite
70 % Ethanol aluminum foil
400 ml beakers
Rootone hormone powder
styrofoam containers
soluble fertilizer
fiberglass or glass lids
African violets, Gloxinia
Swedish Ivy, Coleus,
Philodendron, Rubber tree
Chrysanthemum
Large Glad Bags String

Procedure:

1. *Water rooting* is an effective technique for rooting stem cuttings and leaf cuttings of selected plants. Briefly, this procedure involves preparing a glass or beaker, cutting the stem or leaf from the parent plant, treating the stem or petiole with hormone powder, and placing the stem or leaf cutting into the glass.

2. First fill a 400 ml beaker or glass to within 2 cm from the rim with fresh water at room temperature.

3. Place a square of aluminum foil over the top of the glass and down the entire side of the container. Punch six holes in the foil with a sharp pencil.

4. Select a philodendron stem of approximately 40 cm long and containing 9-12 leaves. You will divide the stem into three parts, each containing at least 3 leaves or three pairs of leaves if you work with a plant like Coleus.

5. Sterilize a new razor blade with a piece of cotton and 70% ethanol, permit it to dry and then cut the stems at the desired sites at about a 45 degree angle. The cut should be just below a node.

6. You should now have three sections seperated from the parent plant. Each section should contain three leaves.

7. Leaf cuttings can also be propagated by water rooting. African violets are often propagated by this means. Select five healthy mature, but not old leaves and cut each with a sterile razor blade through the petiole at a 45 degree angle. Leave at least 3-4 cm of the petiole attached to the leaf. The next step is to treat both stem and leaf cuttings with hormone powder.

8. To prepare these cuttings, carefully remove the lower leaf or pair of leaves from the stem section without damaging thenode. Use a

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razor blade if you wish.

9. Dip the lower end of the stem cutting into the hromone powder. Do one cutting at a time and tap off the excess. The hormone powder will excelerate root formation. Because it contains a fungicide, it also inhibits fungi growth.

10. The leaf cuttings require no special treatment. Dip the leaf petiole into the hormone powder and tap off the excess.

11. Insert five cuttings of each type into the holes of the foiled-covered glasses. Place one cutting per hole. Leave one hole each each glass empty so that the cuttings can be watered or fertilized without disturbing the cuttings.

12. Water rooting cuttings should be placed in diffuse light. It is also important to check the water level in the glass daily. Add more water when necessary by means of a eye dropper or pipette through the empty hole in the foil covering each glass. After root appear, once weekly add an appropriate liquid fertilizer. Be also alert for pest or fungus infestations. The cuttings are more vulnerable to these than are regular plants.

13. *Soil mix rooting* works faster and has several advantages over plain water rooting. The soil mix is one part vermiculite to one part peat moss. A large rectangular styrofoam container with a translucent cover works well for this method. The soil mix is placed in the container 6 cm deep and moistened with distilled or rain water at room temperature.

14. Make small holes in the soil mix with your finger about 2 cm deep for leaf cuttings and 4 cm deep for stem cuttings and at least 4 cm apart.

15. Insert the stem cuttings vertically into the holes in the soil mix, one cutting per hole, and press the soil mix firmly around each cutting.

16. Insert leaf cuttings at an angle so that the edge of the leaf rests on the soil mixture. This will steady the cutting and relieve the petiole of some of the stress of supporting the whole weight of the leaf. Press the soil mix around each cutting.

17. Identify each container with a small piece of tape with the kind of plant and time of cutting.

18. Cover the container with fiberglass or glass cover. Keep the soil mixture moist but not wet and keep in diffuse light. Be alert for fungus or pest infestations. After about two weeks the plants may be lightly fertilized with an appropriate liquid fertilizer.

19. The degree of root growth determines when the cuttings are ready for transplanting. In water rooting cuttings the roots can be observed directly. When the roots are 10-12 cm in length they are

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ready.

20. For cuttings which have been soil rooted, it's best to wait to transplant until new growth is evident. When new leaves appear the root system is developed enough for transplanting.

21. *Air-layering* is the third technique. This is frequently used for hard, woody such as Camellia, or for thick-stemmed or large plants such as the rubber tree or Dieffenbachia.

22. The final shape wanted for both the parent and offspring plant should guide you in choosing proper sites for air-layering. Inner branches or branches that interfere with others are appropriate sites. Air-layering cuts should be made at the base of the chosen branch just above the node.

23. Using a sterile razor blade, cut 1/3-1/2 way through the stem at about a 45 degree angle.

24. Make a second cut below the first at a slightly shallower angle. Remove the thin wedge of stem.

25. Dust the area with rooting hormone powder using a small soft brush.

26. Dip a tooth pick in alcohol and let it dry. Insert the sterile toothpick into the cut. This will keep the stem from growing back together. Trim off the ends of the toothpick.

27. Cut the bottom from the large baggy (size depends of size of stem) and slide over the stem to the cutting. Tie the bottom of the bag. Pack moist peat moss into the bag around the cut area so that a layer at least 4 cm thick surrounds the cut.

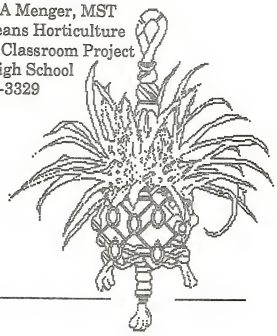
28. Tie the plastic bag securely at the top with string. The air-layered portion of the stem is ready to be seperated from the parent plant when you can see roots growing in the peat moss. This may take one or two months.

29. Using a sterile razor blade cut the rooted stem from the parent. Carefully remove the plastic wrap, but not the peat moss and transplant the cutting into a pot containing moistened potting mixture.

*Adapted from the American Institute of Biological Sciences, Project Bioteck

This is the 4th in a series of articles to help you grow plants for school or home use with better results.

Richard A Menger, MST
Green Jeans Horticulture
Outdoor Classroom Project
Baker High School
(406)778-3329



Fourth Montana Science Olympiad

The Fourth Montana Science Olympiad will be held November 20-21 at Montana State University. The Science Olympiad Tournament is an academic competition consisting of a series of individual and team events. We include biology, earth science, chemistry, physics, computers, and technology during the day-long competition. The state winners of the two divisions have options of advancing to the national competition in the spring. Last year, over 900 junior high and high school students from many Montana schools participated in the Olympiad. Students left realizing that science can be fun. We are looking forward to seeing many familiar faces and greeting new Montana Science Olympians. If you have not attended in the past, check your calendar and consider joining us for a fun-filled day.

First, second, and third place Olympic-style medals are given for each event. In addition, championship tropies are awarded to Division B and C teams compiling the most total points during the Olympiad. Currently, there are two divisions in the Montana Science Olympiad-grades 6-9 (Division B) and grades 9-12 (Division C). Ninth graders who attend schools with grades 6-9 are placed in Division B; those attending schools with grades 9-12 are placed in Division C. A Division B team may have only five ninth grade students. A team should consist of both boys and girls and students from all grades (15 students per team maximum). Only one team is permitted in each division per school. Contact Gerry Wheeler, Director, Science/Math Resource Center, MSU, Bozeman, Montana 59717

The aim of education should be to convert the mind into a living fountain, and not a reservoir. That which is filled by merely pumping in, will be emptied by pumping out.

John M Mason

IMAGINE YELLOWSTONE ART EXHIBIT

Imagine a wolf for a moment... What does your wolf look like? What does it do? Where does it live? Young artists are encouraged to explore colors, textures and media to best express themselves. Few of us have actually seen wolves, seen how they relate to other wolves, their environment, and to man. But we have strong personal feelings about wild animals and wilderness settings that we can express in art. Use your science skills to study and learn about wolves and then express what you have learned with art. Enter your work in the Imagine Yellowstone Art Exhibit.

The 1990 exhibit theme is The Wolf. Imagine Yellowstone provides a unique opportunity for students in grades 5 through 12 to share their artistic images with international visitors to Yellowstone National Park and other locations.

For more information contact David Cowan, Exhibit Coordinator, Division of Interpretation, Box 168, Yellowstone National Park, WY 82190.

Ask him to send you a copy of their Wolf Packet to assist with your science studies.

Science Talent Search

Please encourage your outstanding seniors to enter the 1989-90 Westinghouse Science Talent Search. This competition is aimed at identifying students with the potential to become creative scientists, engineers, and mathematicians. The selections are made on the basis of a report of an independent research project done by the student, personal data, scholastic record, and standardized test scores. The awards include $140,000 in Westinghouse Science Scholarships and forty all-expense-paid trips to Washington for the Science Talent Institute. Other opportunities are also available.

Details of the 1989-90 Westinghouse Science Talent Search are included in a booklet available from Science Service, 1719 N Street, NW, Washington, D.C. 20077-6532. The deadline forentries is December 15,1989.

Dwight D. Eisenhower Mathematics & Science Improvement Funding Program

The federal grant entitled *Education for Economics Security Act* (IEESA), commonly called the math/science legislation, was changed during the last congressional session. The grant is now called *Title II, Dwight D. Eisenhower Mathematics and Science Improvement Program*, and local funds for this program have increased significantly over last year's level.

Montana will receive a total of $642,000 this year from the program. Of that total, $482,000 will be available for elementary and secondary education programs, and $160,000 will be distributed to institutions of higher education offering math and science inservice programs for elementary and secondary teachers. With the carryover money not used by schools during the past year, $450,000 already has been allocated and delivered to Montana school districts that submitted an application by July 1, 1989.

Every district in the state received a project application. However, only 250 districts will receive an allocation from this fund. As in the past, all funds received under this program must be used specifically for inservice training in math and/or science. No money may be used for equipment, instructional supplies, or classroom ma

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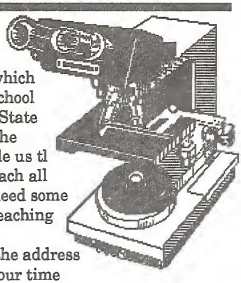
terials unless such materials are directly related to an inservice program. Given the many changes in mathematics and science curriculum in the past several years, including the mathematics and curriculum standards recently published by the *National Council of Teachers of Mathematics* and student goals for math and science in the new Montana accreditation standards, all teachers of math and science K-12 need to be involved in continuous quality staff development programs. We are fortunate to have these federal dollars available for such programs.

Montana is the envy of other states because we have a large cadre of math and science teacher leaders who have received extensive training under three National Science Foundation-funded programs and who are eager to offer quality inservice programs at the local level. The Excellence for *Montana Mathematics Education* (EMME) project recently completed its three-year program of developing teacher leaders at the K-8 level. Ninety-two of these outstanding teachers are currently available to provide quality math inservice programs for Montana elementary teachers. At the secondary level, the Integrating *Mathematics Programs in Computer Technology* (IMPACT) project has provided training for 52 math teachers from grades 7-12. The object of the IMPACT program is to develop ways for teachers to incorporate the computer as an effective math teaching tool. These teacher leaders can provide inservice workshops to demonstrate software programs that can make a difference in how math is taught. In science, the *Better Elementary Science Teaching* (BEST) program recently completed its third summer training program. One hundred fifty elementary teachers have attended the summer programs at Eastern Montana College, University of Montana, and Montana State University over the past three summers. These teachers can present math and/or science workshops in your district or region, and local funds from Title 11 can be used to support these programs.

Over the past three years, these leaders have presented over 500 inservice programs attended by about 6,000 teachers throughout the state. Evaluations by participants consistently indicate the high quality of these programs.

If your district is interested in having one of these highly trained experts provide inservice in math or science for your district, please contact Bob Briggs, Science Specialist (444-4439) or Dan Dolan, Mathematics Specialist (444-4436) for a list of leaders in your region. For additional information on math and science inservice programs that may be funded through the higher education portion of this grant program and/or programs available on a statewide basis, please contact Dan Dolan or Bob Briggs.

A Microbiology Survey



We need your help in determining the extent to which microbiology is being incorporated into Montana High School curricula . The Department of Microbiology at Montana State University is applying for a grant through the Office of the Commission of Higher Education. This grantt will enable us tl develop modules and exercises whlch could be used to teach all areas of microbiology to high school students. We first need some pertinent information which will help us design useful teaching materials for your classrooms.

Please answer the following questions and send to the address below. One or two sentences is all that is required and your time is greatly appreciated.

1. Do you teach any topics in each of the subdisciplines of microbiology, ie., infectious diseases, immunology, food and water microbiology, etc.? How much?

2. If you do, in what class do you teach this material?

3. Again, if you do, list some of the topics you cover?

4. We also need equipment information. What do you have? For example, do you have microscopes, autoclaves, agar for growing bacteria, etc.?

5. How is the equipment used? In laboratory exercises? Demonstrations only, or all of the above?

That's itl. If you can add anything that will help us, please do. Thanks!

Send to: **Barbara Hudson, Instructor**
Department of Microbiology
Montana State University
Bozeman, Montana 59717
(406) 994-6746

INTERMOUNTAIN JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

The 28th Intermountain Junior Science and Humanities Symposium will be held on the University of Utah Campus, February 21-24,1990. As in the past, we wish to invite your district's participation. Food, lodging and symposium expenses for delegates will be covered by the symposium administration. Travel expenses will be the respnsibility of the delegate, school or sponsoring institution.

Additionally, we will be able to send a limited number of delegates who wish to attend and pay their own expenses. The cost will be $145.00 for students and $165.00 for teachers. As was the situation last year "extra delegate" reservations will be assigned by the Montana selection committee until all available slots are filled. Montana schools are responsible to make arrangements directly with Salt Lake, once they have been awarded the "extra delegate" slot.

The symposium is planned with the same format as in previous years. It will be an exciting program, with opportunities for delegates to visit several laboratories on campus and to hear eminent university professors present interesting lectures. Outstanding student researchers will have the privilege of presenting reports of their research efforts in competition for a trip to the National Junior Science and Humanities Symposium.

The criteria for student applications from Montana are as follows:

1. A GPA of not less than 3.00 on a 4.00 scale.
2. Preparation of a research paper on their own individual projects, most of this project to have been completed by November 15.
3. Open to grades 10, 11, and 12.

Selection process:

1. By November 15, research papers of all students who wish to compete for official delegate status, must have arrived at the office of Public Instruction. The cover sheet for the report will consist of the research paper application form which includes the student's name, year in school, name of the high school, the overall GPA, and the title of the research paper. It is to be understood that all of the papers are to be as complete as possible. Abstracts will not be sufficient because of the number of completed papers being received. Some additional work may be included in the paper that will be submitted to the symposium by the selected delegates in January, but only work submitted by November 15, will be considered in the Montana selection of delegates. No application received after December 1, can be considered in the selection process.
2. If a school submits more than one application, a rank order list must be provided by the school science staff to to assist in the selection process, in case of a tie.
3. A selection committee will review the papers and select the official delegates. The quality of the papers submitted will be the major criterion for selection. The score for each paper will be determined by following the criteria on the Research Paper Application Form.
4. Letters will then be sent to all participating schools informing them of the students from their schools who were selected as official and extra delegates with official Symposium forms enclosed. These will need to be returned to Salt Lake officials by December 15. Should an official delegate decide at the last minute not to submit a paper or should additional official
delegate positions become available, the funded official delegate slot will be awarded to alternates selected in rank order by the selection committee.
5. Official delegate status for teachers will be awarded to schools having the largest number of official student delegates.

Any questions concerning the selection of Symposium delegates for this year should be directed to Bob Briggs, Science Specialist, Office of Public Instruction, Helena, Montana 59620.

MONTANA PRE-SELECTION 1990

INTERMOUNTAIN JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

Research Paper Application Form

STUDENT'S NAME_____
Last First

ADDRESS_____
Number and Street City State Zip

SCHOOL_____

SCHOOL ADDRESS_____
Number and Street City State Zip

TITLE OF PAPER_____

_____

_____ _____
Teacher's Signature Student's Signature

This form must be attached to the front of the student research paper, signed by the teacher and student and submitted by the deadline of November 15, 1989. Send to Bob Briggs, Office of Public Instruction, State Capitol, Helena, MT 59620.

(Do not write in this space - Official use only)

MONTANA SELECTION COMMITTEE EVALUATION

Point Values	4	3	2	1	Remarks
I. RESEARCHABLE QUESTION					
II. RESEARCH DESIGN					
III. PROCESS					
IV. ANALYSIS					
V. CONCLUSION					

OVERALL RANKING_____

HOW TOXIC IS TOXIC?*

Toxicologists have evolved a quantitative measure to answer the question, *How Toxic Is Toxic*? "Test Conditions" have been established to determine this important quantitative standard. Among the "Test Conditions" are:

A. What toxic substance is being tested?
B. What species of test animal (rats, etc.) was used in the test(s)?
C. How was the toxic substance administered (oral, injection, skin absorption)?
D. State test animal body weight (expressed in grams) as a function of the volume of toxic substance administered?
E. Of the total group of test animals what percentage succumbed?

A typical toxicological statement which includes these "Test Conditions" might be this example: Aniline LD_{50} Orally in rats: 250 mg/kg

LD means single Lethal Dose.
The **subscript 50** means 1/2 or 50% of the test animals succumbed.
Oral means the method of toxic substance administration.
Rat states the test species used.
kg (kilogram equals approx. 2.2 pounds) Defines a unit of test animal body weight as a function of the quantity of toxi substance administered.

The lower the LD_{50} the more toxic the substance. The chart below provides LD_{50} data for many items listed in the 1987 FLINN CHEMICAL CATALOG/REFERENCE MANUAL. *Flinn Scientific Inc, Box 219, Batavia, Illinois 60510

Substance LD_{50}	Oral-Rat Per kilogram	Substance LD_{50}	Oral-Rat per kilogram	Substance LD_{50}	Oral-Rat per kilogram
Acetaldehyde	1930 mg	Cobalt (ous) Chloride	766 mg	Methyl Alcohol	5628 mg
Acetamide	7000 mg	Cobalt (ous) Nitrate	691 mg	Methyl Ethyl Ketone	2737 mg
Acetanilide	800 mg	Cobalt ous) Sulfate	768 mg	Methyl Iso Butyl Ketone	2080 mg
Acetic Acid	3310 mg	Colchicine	1.6 mg	Methyl Methacrylate	7872 mg
Acetic Anhydride	1780 mg	Crystal Violet	420 mg	Methylene Blue	1180 mg
Acetone	7500 mg	Cupric Acetate	710 mg	Methylene Chloride	2136 mg
Acetyl Salicylic Acid	1000 mg	Cupric Chloride	140 mg	Naphtalene	1250mg
Adenine	745 mg	Cupric Nitrate	940 mg	1-Napthol	**2400 mg**
Ammonium Hydroxide	350 mg	Cupric Sultate	300 mg	Nicotine	50 mg
Ammonium Molybdate	33 mg	Cuprous Chloride	265 mg	1-Octadecanol	20 gm
Amyl Acetate	6500 mg	Cuprous Oxide	470 mg	Orcinol	844 mg
n-Amyl Alcohol	2200 mg	Cyclohexane	29820 mg	Oxalic Acid	375 mg
Aniline	250 mg	Cyclohexanol	2050 mg	1,10-Phenanthroline	132 mg
Aniline Hydrochloride	1072 mg	p-Dichlorobenzene	500 mg	Phenol	384 m
Antimony Trichloride	525 mg	Diisopropanolamine	6720 mg	1,4-Phenylenediamine	80 mg
Arsenic Trioxide	15100 mg	1,4 Dioxane	4200 mg	Phenyl Thiocarbamide	3 mg
Barium Acetate	921 mg	Dodecyl Alcohol	12800 mg	Phthalic Anhydride	4020 mg
Barium Carbonate	418 mg	Ethyl Acetate	6100 mg	Potassium Carbonate	1870 mg
Barium Chloride	118 mg	Ethyl Alcohol	7060 mg	Potassium Cyanide	10 mg
Barium Nitrate	355 mg	Ethylene Diamine	1160 mg	Potassium Hydroxide	365 mg
Benzaldehyde	1300 mg	Ethylene Dichloride	670 mg	Propionic ACid	3500 mg
Benzene	4894 mg	Ethylene Glycol	4700 mg	n-Propyl Alcohol	1870mg
Benzoic Acid	2530 mg	Ferric Chloride	984 mg	Pyridine	891 mg
Benzoyl Peroxide	7710 mg	Ferric Nitrate	3250 mg	Pyrogallol	789 mg
Benzyl Alcohol	1230 mg	Formaldehyde	80 mg	Resorcinol	301 mg
Benzyl Benzoate	500 mg	Fumaric Acid	10700 mg	Salicylic Acid	891 mg
Bromobenzene	2699 mg	Glycerine	12600 mg	Sodium Chloride	3000 mg
n-Butyl Alcohol	790 mg	Hexamethylenediamine	750 mg	Sodium Cyanide	6440 ug
sec-Butyl Alcohol	6480 mg	Hexanes	28710 gm	Sodium Fluoride	80 mg
tert-Butyl Alcohol	3500 mg	Hexyl Alcohol	720 mg	Sodium Thiocyanate	764 mg
Butyric Acid	8790 mg	Hydroquinone	320 mg	5-Sultosalicylic ACid	2450 mg
Cadmium	225 mg	Iodine	14 mg	Thiourea	125 mg
Cadmium Chloride	88 mg	Iso-Butyl AlCohol	2460 mg	Thymol	980 mg
Cadmium Nitrate	300 mg	Iso-Propyl Alcohol	5045 mg	Toluene	5000 mg
Caffeine	192 mg	Lactic Acid	3730 mg	Trichloroacetic Acid	5000 mg
Calcium Fluoride	4250 mg	Lauric Acid	12 gm	1 1,1 Trichloroethane	10300 mg
Carbon Tetrachloride	2800 mg	Lithium Carbonate	525 mg	T,lchloroethylene	7193 mg
Cetyl Alcohol	6400 mg	Maleic Acid	708 mg	1,1,2 Trichloro Trifluoroethane	43 mg
Chlorotorm	908 mg	Malonic Acid	1310 mg	Triethanolamine	8680 mg
Chromium (ic) Chloride	1870 mg	Menthol	3180 mg	Tris-(Hydroxymethyl) Aminomethane	5900 mg
Chromium (ic) Nitrate	3250 mg	Mercuric Chloride	1 mg	Xylenes	4300 mg
Citric Acid	11700 mg	Mercuric Iodide	40 mg	Zinc Acetate	2460 mg
				Zinc Chloride	350 mg

The MSTA Board of Directors wishes every teacher much success during this school year.

Postage

Editor-in-Chief Richard A Menger, MST
Biology Department, Baker High School
Box 659, Baker, Montana 59313-0659

MSTA will help the individual participate in determining the destiny of science in Montana. The organization serves as a vehicle for educators from all professions to exert positive influences on young people. Many important decisions concerning the scope and direction of science education will be strongly influenced by our organization.

MSTA goals are to increase public awareness, interest and support of science education in Montana.

Montana Science Teachers Association

MSTA

Dedicated to Quality Education

Membership Category:	
1 year	$ 10.00
2 years	$ 17.00
3 years	$ 24.00
Life	$100.00
Student /Retired	$ 3.00

Membership dues are $8.00 and are payable to Gil Alexander, Tresurer, Helena High School, Helena, Montana 59601. Membership includes a one-year subscription (4 issues) to *The Montana Science Teachers Association Newsletter.*